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7 October 2014

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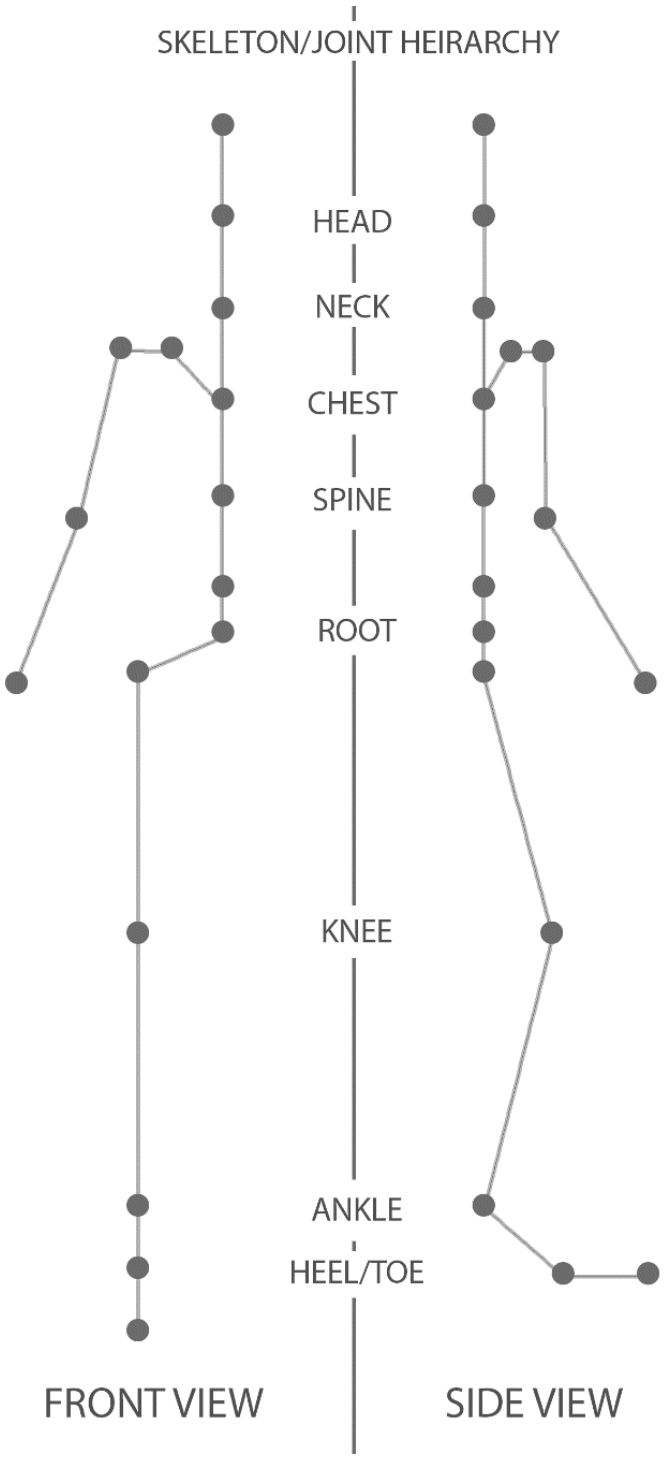
To Whom It May Concern,

This reference guide is meant to be a cheat-sheet for intermediate Maya users. It is meant to help users quickly set up a Humanoid Character Rig and to create a simple, yet effective, series of tools and interactions to allow them to be able to animate a 3D character. The tools used inside Autodesk Maya include: Inverse Kinematics, Forward Kinematics, Nurbs Shapes, Joints, as well as Point, Orient and Pole Vector Constraints. These tools will allow readers to quickly create a skeletal joint hierarchy for their character, attach components that will allow users to animate rigs themselves, skin their mesh to the rig, and be able to export this character for use in other environments, such as Mecanim in Unity, which supports motion capture data, and HumanIK in Maya itself. Only the main components for creating a character rig are presented in this document, it is by no means a guide for beginners. As for the reliability of this document, I have been using Autodesk products and creating animation and 3D content for games for over 6 years. I have successfully created projects employing the Mecanim system in Unity, and have perfected a pipeline for creating 3D human characters, from concept art, to unwrapped, skinned and textured mesh with a complete rig. Please consider this document when you are looking for material to place on your website, it can be a saving grace for intermediate Maya users looking for a simple guide to setting up their own character rigs.

Sincerely,

Nikita Filatov



LAYOUT

Begin to set up your character's skeleton using the guidelines on the left. The spine joint amount is variable based on your character and whether or not you intend to use spline IK. Remember to create collarbones for your shoulders, as well as an extra joint for the pelvis transformations.

When creating the arm and leg joints, make sure to add a small bend at the knee and elbow, in order for the Rotate-Plane IK solvers to accurately simulate joint rotation. This setup will work with motion capture solutions such as Human IK in Maya and Mecanim in Unity.

Remember to Orient Joints and Freeze transformations before moving on with your rig. The joints X-Axis must face the same direction as the World's X-Axis.

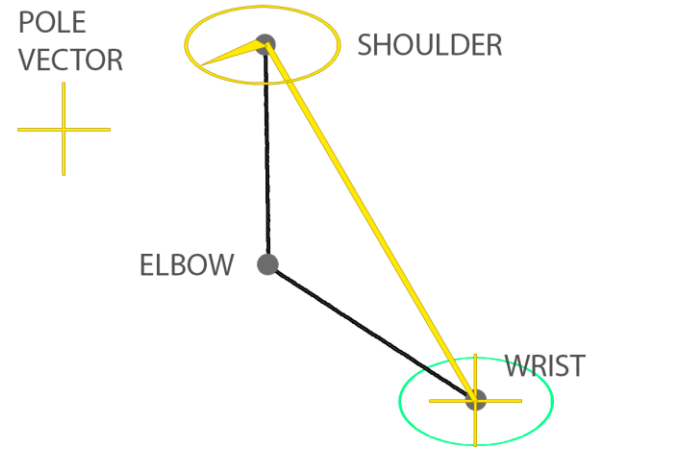
After setting up half of your joints, you may use the Mirror Joints tool to duplicate your arms and legs, and parent them to their corresponding joint connections to complete your skeleton. Do not mirror the Spine.

SKINNING

There are several options when it comes to applying a Skin to between your mesh and your joints. You can use the simple Rigid Bind to attach object that don't deform to your joints directly. You can use the smooth bind option to skin deformable objects to your joints.

Smooth binding also allows you to use Dual-Quaternion deformation between joints, eliminating the need for extra twist joints between your shoulder, elbows and wrists. You can use the Interactive option during the smooth bind, which will allow you to apply transformations to deformer capsule between joints.

Lastly, you will want to move your rig around and observe how your mesh deforms, and use the Paint Skin Weights tool to blend the weights between vertices and joints.



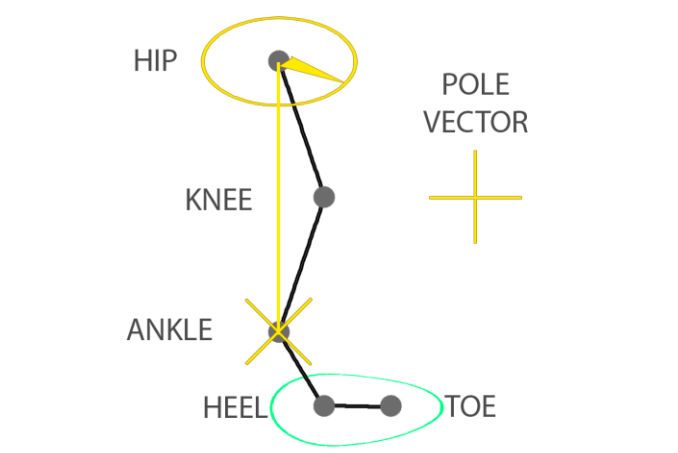
ARM

Select the IK Solver tool and switch to RP Solver, then select the **shoulder**, followed by the **wrist**. This creates a rotate-plane solver between these two joints.

The system doesn't know how to orient the elbow, so create a **nurbs** shape or locator object, select it, then the IK solver you just created, and create a Pole Vector Constraint.

Lastly, create a **nurbs** shape such as a circle (shown in green), and hold V to snap move it to the wrist joint. Select the circle, then select the IK Solver, and create a Point constraint. This allows you to control the IK Handle without manipulating it directly.

You can also create and Orient Constraint between the **nurbs** circle and your wrist joint that will allow you to control the hand with FK.

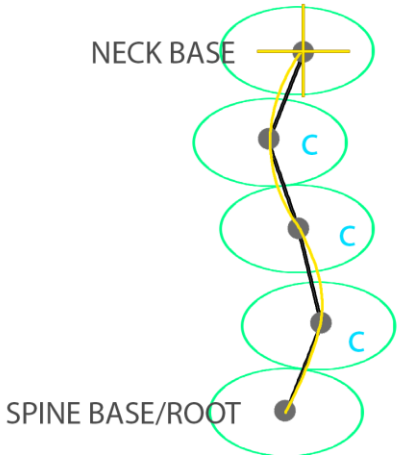


LEG

As with the arm, create another IK-RP solver between the **Hip** and **Ankle** joints. Create a locator or **nurbs** shape and create another Pole Vector Constraint between the IK Solver and the object you created, to point the knee joint in the right direction.

Create a foot shaped **nurbs** shape, place it on the ground under the **heel** and **toe**, and create a Point Constraint between it and the IK Solver you just made, as with the arm.

Creating an Orient Constraint between the heel joint and the **nurbs** foot shape will allow you to rotate the foot. Remember to maintain offset in the setting for your constraints so that the joints do not snap to the shape's position.



SPINE

Select the spine joints starting from the root, and create a Spline IK Solver. This solver cannot be controlled directly, but you can create **Deformer Clusters** for the control points of the **spline** that is generated.

Once you have these clusters, point constrain them to **nurbs** circles snapped to the corresponding spine joints.

Select the base **spline cluster** and create both a Point and Orient Constraint between it and your **Hip** **nurbs** circle. Do the same with the spline **cluster** at the **neck** base joint.